Jim Favors
726-7028

VIDEO DIGITIZER

FOR COMMODORE

BY KINNEY SOFTWARE

KINNEY SOFTWARE
121 NORTH HAMPTON ROAD
DONNELSVILLE, OHIO 45319

VIDEO DIGITIZER FOR THE COMMODORE 64 (VER 1.2)
by KINNEY SOFTWARE
121 N. Hampton Rd.
Donnelsville, Ohio
45319

VIDEO DIGITIZER OPERATING INSTRUCTIONS

SETUP

Prior to applying power to your computer ensure that the video digitizer is properly connected to the computer. You should never connect the digitizer to the computer with power on, as damage can result to your computer!!! The video signal to be digitized should be approximately equal to RS-170 format for composite video. The video output jack on most popular video tape recorders is an excellent source. Live (moving) video sources can be used; however, since the image takes about 3 seconds to be digitized, some pronounced distortions can result.

NOTE: The program disk now includes demonstration images. Insert disk and type LOAD"DEMO",8 and RUN after loading completes to view sample images.

OPERATION

1) Before applying power to computer, connect digitizer board to user I/O port

2) Connect video cable from video source to input jack (J1) on digitizer board.

3) Power up your computer, insert the program disk and type LOAD "VIDEO",8

4) After loading is completed type RUN and <return>.

5) The digitizer will display "loading" message and then a MAIN MENU.

6) Follow the MAIN MENU commands as detailed below.

NOTE: If no video is being applied to the digitizer, the screen will go black and the computer will not respond to the keyboard. (Simultaneously depress the RUN/STOP & RESTORE keys if you wish to regain control of the computer.) The digitizer demands every microsecond of processing time available so the keyboard is disabled for most of the operations. To enable a key input you must be patient and wait for the program to get around to you! Usually the delay is under 3 seconds - however the key must be continously depressed until sensed.

MAIN MENU

< A > Selects 8 grey levels

< B > Selects 6 grey levels

< C > Selects 4 grey levels

< D > Switches the screen display to the present image in memory. If option D is selected prior to image capture a random pattern will be displayed. Select option M to return to main menu.

< W > Selects 2 grey levels - useful for special high contrast images such as lettering.

< X > Selects 3 grey levels - (bit pattern 10 not used) - provides more flexibility for Koala users

< Y > Selects 5 grey levels - (bit pattern 10 not used)

< Z > Selects 7 levels - provides the best quality screen dumps when using the Doodle or Printshop graphics programs.

< M > Displays the MAIN MENU

< F1 > ADJUST mode - used to obtain quick real time adjustment of contrast and brightness. Do not attempt to save images obtained while in adjust mode as they are distorted due to internal design of the computer.

< F3 > HOLD mode - used after adjustments are completed to freeze image in memory for viewing or saving to disk. When F3 is selected from menu, the system will blank the screen to the border color for the duration of the process (about 3 seconds). The digitized image will then appear and remain until F1,F3,F5,F7 or M is selected.

< F5 > REPEAT mode - used like F3 to capture images but repeats the digitizing process after a brief display of the captured image. To stop operation when you wish to save or examine an image continously depress the M key - the program will return to MAIN MENU.

< F7 > SAVE - used to select SECOND MENU (save and modify). When selected from the MAIN MENU, F7 exits the machine languge program and presents a SECOND MENU which allows several additional operations described below.

SECOND MENU

SAVE FORMAT SELECTION

< S > Save Standard image file to disk
< K > Save KOALA image file to disk
< P > Save Printshop image file to disk
< D > Save Doodle image file to disk
< N > Save NEWSROOM photo file to disk

ADDITIONAL FEATURES - SECOND MENU

< Z > Permits review of disk directory
< L > Loads image file (standard format only)
< R > Returns to digitizer operations
< C > Modifies display coloring (PSEUDOCOLOR)

NOTES:

< S > Saves image as a program file 32 blocks long. Image memory at locations $6000-$7F3F is saved. The save uses conventional filenames.

< K > Saves image bitmap, screen and color memory in the proper format, locations, and filename to be read back under the Koala drawing program. This allows you to digitize images and later modify them as permitted by the KOALA program! The digitizer program will insert the special first character and pad the name with spaces for you, but you MUST enter the PIC A name format sequence. Do not go out of alphabetical order on the disk directory. (PIC A ... PIC B ..... PIC C.... PIC D .... etc.) Use the Z key to list the present disk directory to be sure of the filenames and sequence on disk before using the K save feature.

< D > Saves image bitmap and screen memory for recall in Doodle format and locations. The first two letters of the filename (DD) are automatically inserted for you.

< P > Saves image bitmap in locations as required for recall by Printshop. The 5 or 7 grey level modes generally produce the best screen printouts.

< N > Converts and saves images into a format compatible for loading into Newsroom's photo lab. The image file is first brought into Newsroom using the Photo Lab's "load a photo" mode. Please note that you must follow the sequential steps exactly as detailed by Newsroom to incorporate the image into a form usable by the Layout Editor. The image should be digitized using the 5 or 7 grey level mode (Key Y or Z) for best results.

< C > PSEUDOCOLOR allows selection of certain colors to represent grey levels. This process is commonly seen in weather maps where rain or clouds are displayed in different colors depending on their intensity. The Commodore permits 4 colors to be selected in the 160 x 200 multi-color mode used by the digitizer. When C is selected from the second menu, another MENU screen is displayed with a color number chart. If you wish to modify the display simply select < Y > and answer the questions. < N > will return you to the second menu (save / modify). The results of your new color choices can be seen by depressing < D > (for display). The bitmap pairs are arranged as follows: 00 = background (darkest), 01 = hi nibble (med. dark), 10 = lo nibble (med. light), and 11 = color (lightest). Once you modify the color using this function and return to digitizer operations all displays will use the new colors. To return to original (standard grey) colors it is necessary to re-enter the "standard" values as follows or restart the program.

Standard Color values;

```
Background = 0  Black
Hi Nibble  = 11 Grey 1
Lo Nibble  = 12 Grey 2
Color      = 15 Grey 3
```

For best results, follow the dark to light suggested value sequence. Old fashioned "TINTYPE" coloring can be obtained by using;

```
Background= 9
Hi Nibble = 10
Lo Nibble = 7
Color (c) = 15
```

For an all blue effect;

```
Background = 11
Hi Nibble  = 6
Lo Nibble  = 14
Color      = 3
```

For reverse image;

```
Background = 1
Hi Nibble  = 15
Lo Nibble  = 12
Color      = 11
```

Do not use all zero colors, the display will never be visible (all black) !.

GENERAL NOTES

You must insert a correctly intialized disk with enough room (at least forty blocks) for an image save. Make sure to save the image in the correct format for the particular graphics program which you will be using. If you should happen to "BREAK" out of the Basic portion of the program simply type RUN20 to restart without a complete reload. Your image in memory will not be lost.

USE OF SAVED IMAGES WITH DOODLE, KOALA, NEWSROOM, AND PRINTSHOP or BASIC

BASIC

Study the included program listing of graphics BASIC subroutines needed for display of saved images in BASIC. Also you may load the DEMO program included on the program disk and examine how several images are loaded off disk. To load your digitized images (standard format only) using the DEMO program simply define Z$ as the title of your image. EXAMPLE: Add line 156 Z$="MYIMAGE":GOSUB200

DOODLE

To load a digitized image file from disk under control of Doodle, use the Doodle C2 command for disk load. Your image filename should appear as a Doodle. After loading, use the color F2 negative and home keys to restore image contrast. You may now modify the digitized image using the powerful features of Doodle. To print out a digitized image under Doodle, go back to the C2 command and print out as you would any other Doodle image.

PRINTSHOP

To load a digitized image file from disk select the "screen magic" option of Printshop. Use the "get" command to load in the image. Follow the Printshop commands to print out the image as a negative or positve. You may use Printshop to add fancy lettering to the image prior to obtaining an image printout.

KOALA

To load a digitized image file from disk select disk operations on the Koala screen. Your image filename should appear on the disk directory display. Select the "get" function and load in the image. After loading finishes you may return to the Koala main menu for graphical operations on the digitized image.

NEWSROOM

To load a digitized image file from disk under control of Newsroom select the Photo Lab option of Newsroom. Use the disk operation "load photo" to load your digitized image. The image file appears as a PH. file to Newsroom and is recognized as a photo. The PH. prefix was automatically inserted for you by the digitizer Newsroom save process. Please note that you must carefully follow the sequence of steps detailed by Newsroom to have the photo appear on the Layout Editor listing. Follow the Newsroom sequence of "Photo Lab" to "Copy Desk" to "Layout" for proper incorporation of the photo. The digitized photo is a full panel in size. Remember to use the 5 or 7 grey level mode of the digitizer to provide the best printout quality with Newsroom.

SCREEN DUMPS

Do to the tremendous variety of printers and interfaces we do not include screen dump software. The dump routines in Printshop, Newsroom, and Doodle will work to provide hardcopy of an image saved to disk from the digitizer in the proper format.

MEMORY USEAGE AND COLOR INFORMATION

The machine language portion of the digitizer program is located at $C000 to $CFFF. Screen memory is at $5C00 to $5DE7 and intially contains $BC. This value is modified by use of the PSEUDOCOLOR feature if you change the hi or lo nibble values. Standard color memory is used ($D800 to $DBFF) and intially contains $0F. Background color ($D021) is intially $00. All displays are in the 160 x 200 multi-color bit map mode. Refer to the Commodore 64 Programmer's reference Guide pages 127 and 128 for additional details.

```
5000 REM*SUBR TO LOAD BITMAPPED IMAGE
5002 PRINTCHR$(147)
5003 PRINT:PRINT:PRINT
5005 INPUT"IMAGE FILENAME";Z$
5006 IF Z$="" THEN 20
5012 PRINTCHR$(147)
5014 PRINT:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
5016 PRINT"     PLEASE STANDBY FOR 30 SECONDS"
5017 PRINT:PRINT
5018 PRINT"     WHILE I LOAD  ";Z$
5019 PRINT:PRINT:PRINT"     PRESS SPACE BAR TO GO ON AFTER IMAGE"
5020 OPEN 1,8,0,Z$
5030 POKE185,0:POKE780,0:POKE781,0:POKE782,96:SYS65493
5040 CLOSE1
5050 RETURN
6000 REM SUBR TO SETUP GRAPHICS
6002 PRINTCHR$(147)
6004 PRINT:PRINT:PRINT:PRINT:PRINT"     PLEASE STANDBY FOR 20 SECONDS"
6005 PRINT:PRINT"     WHILE I SET UP SCREEN & COLOR MEMORY":PRINT:PRINT:PRINT:PRI
NT
6006 PRINT "    TO  GO  ON AFTER VIEWING IMAGE"
6008 PRINT"    PRESS SPACE BAR...."
6010 REM NORMAL VALUES:A=0: B=188: C=15
6031 REM*** A=BACKGND B=SCREEN C=COLOR
6032 A=PEEK(49524):B=PEEK(49437):C=PEEK(49529)
6035 POKE 53281,A
6036 SYS 49184
6037 GOTO 6070
6038 REM ***IMPORTANT NOTICE***
6039 REM DELETE LINES 6036 AND 6037 WHEN USING IN OTHER BASIC PROGRAMS!
6040 FOR I=1 TO 1000
6050 POKEI+23551,B
6060 POKEI+55295,C
6065 NEXTI
6070 POKE 56576,(PEEK(56576)AND 252 OR 2)
6071 POKE 53265,PEEK(53265) OR 32
6072 POKE 53270,PEEK(53270)OR16
6073 POKE 53272,PEEK(53272) AND 7 OR 120
6075 GET K$:IF K$="" THEN 6075
6080 RETURN
7000 REM*SUB TO RESTORE TEXT DISPLAY
7010 POKE56578,PEEK(56578)OR3
7020 POKE 56576,(PEEK(56576)AND252)OR3
7030 POKE 53265,PEEK(53265)AND223:POKE 53270,PEEK(53270)AND239
7040 POKE 53272,21:POKE 53281,246
7050 RETURN

READY.
```

VIDEO DIGITIZER ASSEMBLY, ALIGNMENT, AND TROUBLESHOOTING INSTRUCTIONS

THEORY of OPERATION

The digitizer operates by using a syncronized sampling process. The incoming video signal is sampled at a certain point on each horizontal line. The digitizer slowly sweeps this sampling point from left to right across the picture (approx 3 sec.). This results in a vertical column of pixels being sampled at a rate of one vertical column every 16.667 ms. The computer reads the sampled data (collected in vertical columns) and converts the data into a bit mapped image under software control. Refer to the digitizer schematic. The bi-lateral switch, U3, is switched in response to each horizontal sync pulse as delayed by the time duration of one shot U1. The video sample and hold function is performed by the switch action of U3 and a small capacitor buffered by a section of U2. The length of the delay of U1 is modulated by the charging capacitor time constant formed by the rate pot, a 100K resistor and a 22 microfarad capacitor. This long time constant (approx 4 sec) controls the left to right sweep of the sampling across the video image as the delay value of U1 is altered. Transistors Q2 and Q1 are sync separator-buffers with a part of U2 performing as a vertical sync filter which drives output transistor Q3. The vertical sync and horizontal "sweep" processes are controlled Q4. If Q4 is turned on then the digitizer is in operation. Q4 must be turned off to reset the process before another picture can be digitized. The computer, under software control, determines which level to apply to the base of Q4 via pin D. The sampled video is buffered by a section of U2 which then drives the modulation input of timer U4. U4 is configured to provide a variable pulse width (pin 6) to the computer I/O input port in response to a trigger from the I/O port (pin 8). The computer determines the value of grey scale based on this pulse width. The computer also determines when to start a new vertical column by sensing the level as provided by Q3 (vertical sync) as seen on pin C.

ALIGNMENT

1) Set all pots to mid rotation-except contrast. Set contrast to min. (min resistance between pins 8&9 of U2).

2) Apply a known good source of RS-170 composite video which contains lettering or a pattern which can be referenced for scan width and centering. (Movie title, weather maps, phone numbers etc.)

3) Operate digitizer in adjust mode (F1). Carefully and slowly turn course brightness pot VR5 until mid-grey scale image is apparent (use "C" mode). Approximate resistance of 600 ohms to 1.4K measured from wiper to active end of pot. The grey level pattern should be nearly consistant with only a few black speckles. Very coarse herringbone patterns indicate improper setting of VR5 or improper components in the associated circuitry.

4) Slowly adjust rate control VR4 to obtain a total image which matches the input pattern. It is necessary to effectively clip the extreme left and right sides of the image to obtain the best horizontal linearity. Minor adjustment of VR3 may also be tried to obtain the best results (VR3 and VR4 are interactive and have very similiar effects). Your final settings will match most home television images in scan width and centering.

PARTS LIST

RESISTORS

1 - 470K , 1/4 watt 5%
4 - 100K "
14- 22K "
5 - 10K "
1 - 4.7K "
6 - 2.2K "
2 - 220 ohms "
1- 68 or 82 ohm "

CAPS

3 - 22MFD elec., 25vdc vert. mount
3 - .1 disc. 12wvdc 20%
5 - .01 disc. 12wvdc 20%
3 - 39 (or 47) picofarad disc 20%

I.C./ Transistors	RS=Radio Shack
3 - NPN (Q1,Q3, Q4) 2N3904 or equiv	RS#276-1603 or 276-1617
1 - PNP (Q2) 2N3906 or equiv	RS#276-1604
2 - CMOS 7555 timer 8 pin dip U1 & U4	RS#276-1718 or 276-1743
1 - LM 324 quad op amp U2	RS#276-1711
1 - CD4066 CMOS quad switch U3	RS#276-2466

I/O CONNECTOR: 24 contact, 12 position .156 center
AMP # 530667-3 8136
CINCH#251-12-90-160 (50-24EE-30)
Digi-Key Part number C1-12 ($2.90 + $2 S &H) refer to their catalog for more information. They also carry most of the other components needed.

Digi-Key Corp.
701 Brooks Ave. South, PO Box 677
Thief River Falls, MN 56701

SOCKETS: Recommended for U2 and U3. RS#276-1999

POTS

1 - 100K (VR1 - contrast)	RS#271-220
1 - 100K (VR4 - rate) min pc mount	RS#271-338
1 - 10 K (VR2 - bright)	RS#271-218
1 - 10 K (VR3 - width) min pc mount	RS#271-335
1 - 5K or 10K (VR5 - coarse) min-pc	RS#271-335

ASSEMBLY The sequence of assembly should be the jumpers first, followed by fixed resistors, and then the IC's. The caps and VR's should be last. MAKE SURE TO USE ONLY HIGH QUALITY ROSIN CORE ELECTRONIC SOLDER. Carefully clean the board of all flux after soldering.

CHECKOUT & TROUBLESHOOTING

Prior to connection to your computer, double check for bad joints or solder bridges. Make sure resistors are of correct value; be especially careful about mixing 220, 2.2K and 22K values! Use an ohmeter to verify that the V+ line is not shorted to ground. After your checks and you are confident of the connector, wiring etc, connect to the computer user's I/O port. The digitizer draws less that 5 mills. With a known good video source applied, load the program as instructed above. Select the 4 grey level mode and F1 (adjust mode). The program will now cycle the digitizer and when looking for signals remember that Q4 is turing on and off every 3 seconds. The vertical sync pulse on collector of Q3 (J2 pin C) must be present -- occasionally insufficent gain of Q1 and Q2 will occurr -- this is fixed by changing the value of the 100K resistor across pins 1 and 2 of U2 to 220K. Make sure the sync signal input is correct (approx 1 volt) before adjusting. Improper or no vertical sync pulse will cause the digitizer to stop completely. If the vertical sync is erratic the digitized image will have a very noticable vertical jagged effect. Correct operation of U1 can be seen on pin 3 of U1 as a varying width pulse, starting in sync with the horizontal sync pulse. If horizontal or vertical sync is faulty check around Q2 and Q1 first as they are the sync separator-buffers. When operating correctly, the voltage on pin 5 of U4 will be 3.3 +/- 1 volt nominally. The timer U4 responds to trigger pulses from the computer with a variable pulse wdith (less than 50 microseconds- determined by VR5 and the incoming video signal). If the horizontal sweep appears non-linear, try changing the 22 microfarad cap on pin 12 of U2 (leakage will cause non-linearity).

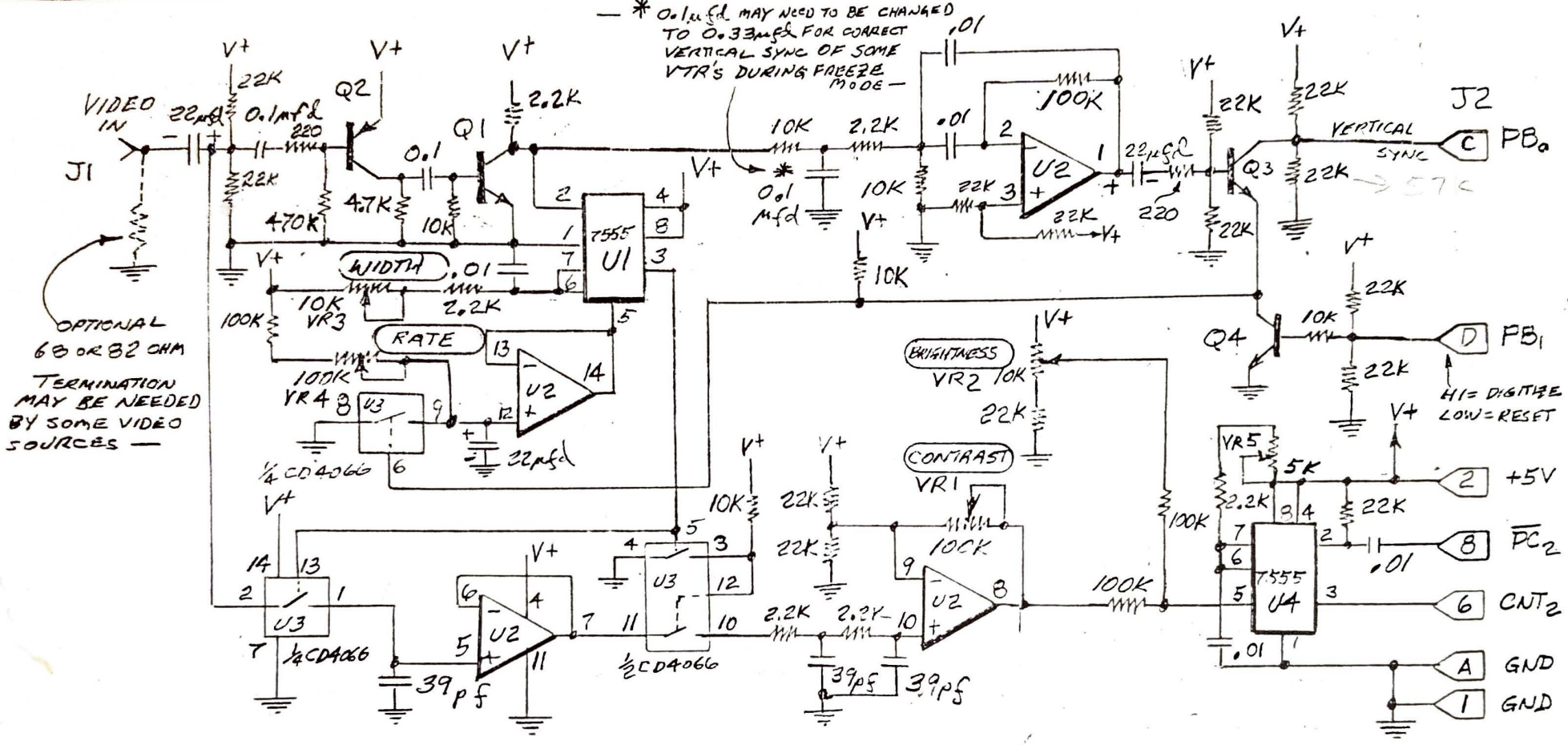
TROUBLESHOOTING HINTS

The most common assembly error is improper resistor values and missing components. Recheck resistors carefully as the red, brown and yellow bands are easily confused! Double check capacitor values. One very difficult (but has happened) problem is conductive flux. You must clean the board of flux after soldering. Approximate resistance settings for the pots are as follows:

VR1 manually adjust for best image contrast
VR2 manually adjust for desired brightness
VR3 width - 1 to 2 K
VR4 rate - 5 to 15K
VR5 coarse brightness- 600 ohms to 1.4 K

No apparent operation-screen goes black and stays black. Check for correct sync and video input. Check for sync pulses on J2 pin C into computer with oscilloscope.

Image is very compressed or unnaturally elongated- most likely caused by improper setting of VR3 or/and VR4. May also be caused by defective cap on pin 12 of U2 (22mfd.)



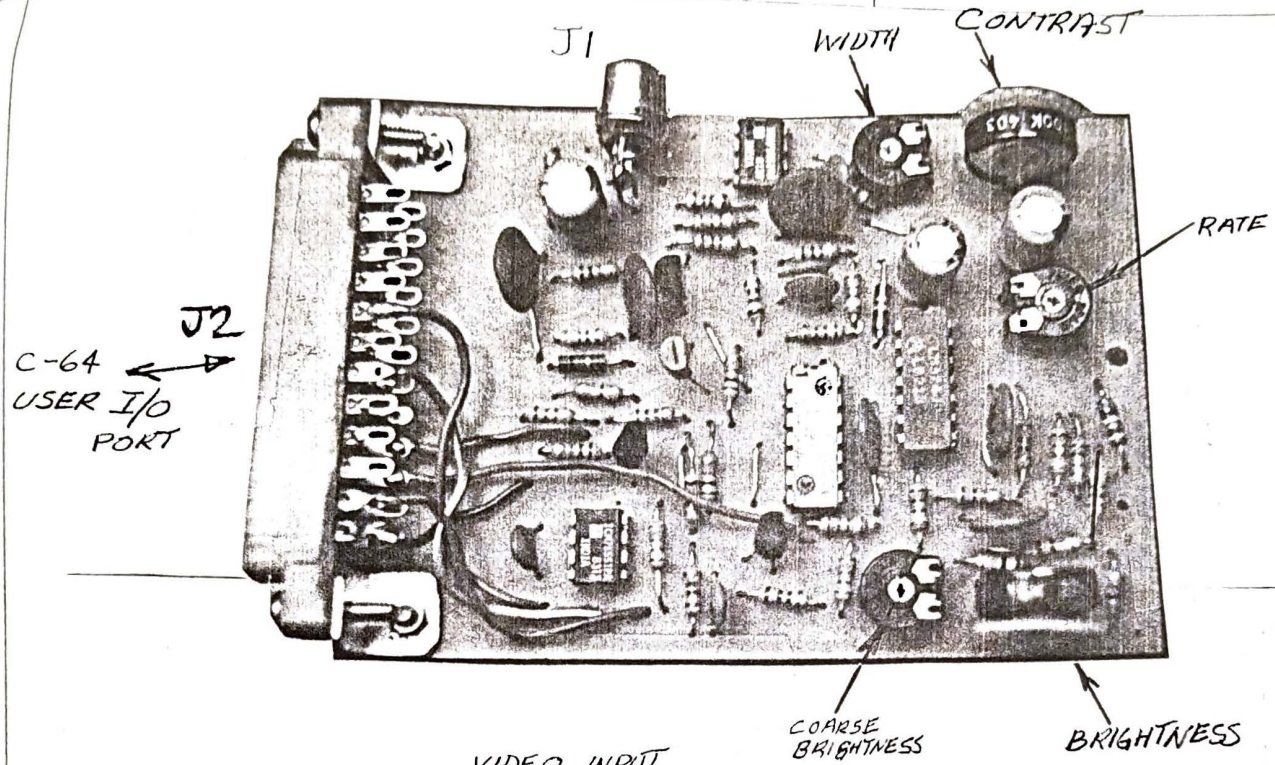
VIDEO DIGITIZER
COMMODORE-64

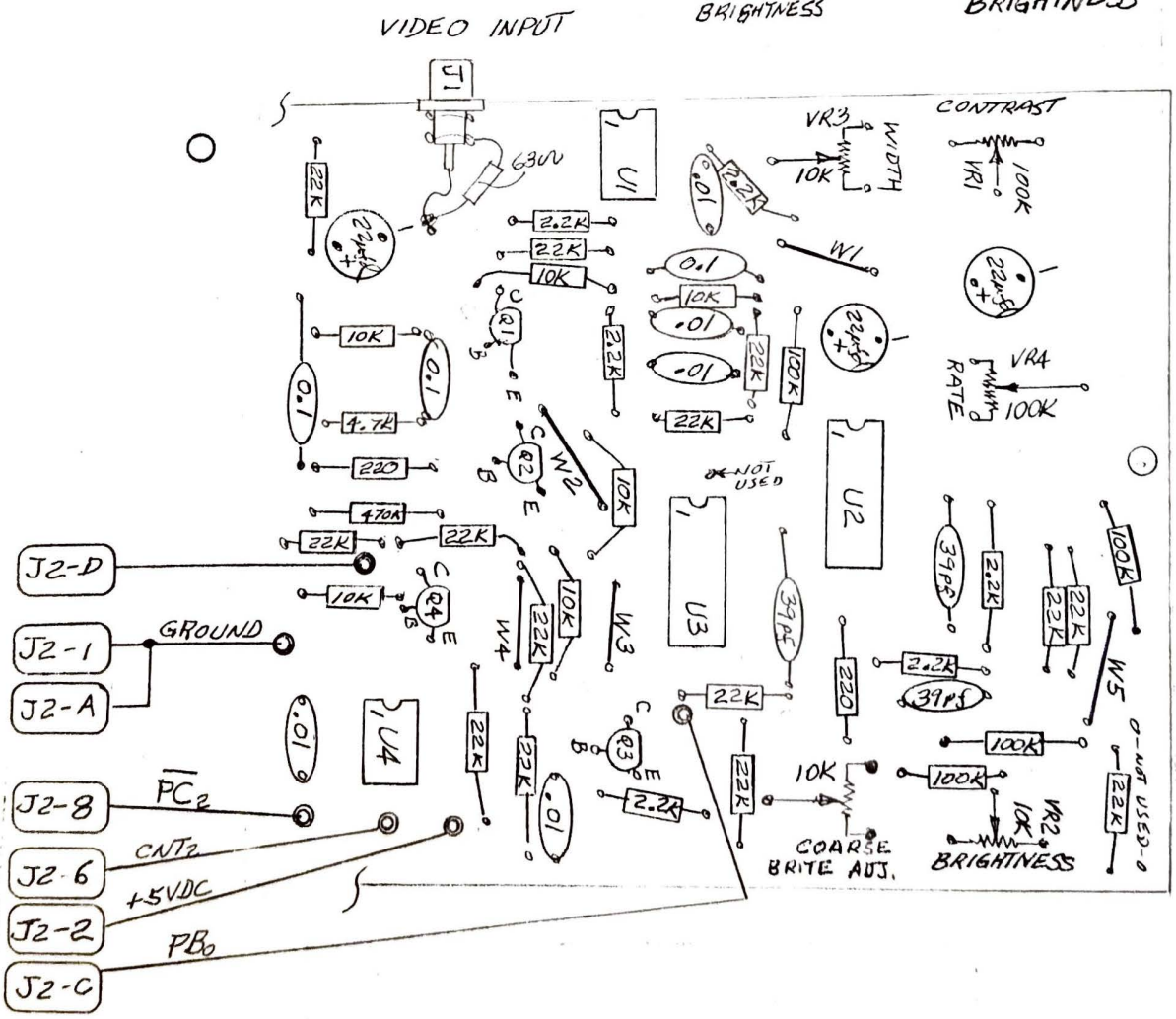
U1, U4 = 7555/TLC555 TIMER, LOW POWER
U2 = LM324 QUAD OP AMP
U3 = CD4066 QUAD BI-LATERAL SWITCH OR EQUIV.
Q1, Q3, Q4 = 2N3904 NPN
Q2 = 2N3906 PNP

NOTE: V+ = +5 VOLTS DC FROM PIN 2

J2, ⬠ = COMMODORE 64 USER I/O CONN.

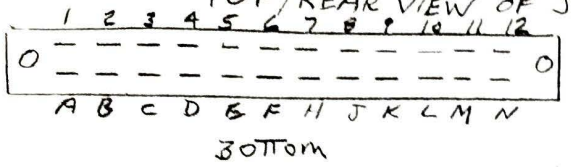
**** C64VDITZ ****
C-64 VIDEO DIGITIZER
by KINNEY SOFTWARE
121N HAMPTON RD DONNELSVILLE OH



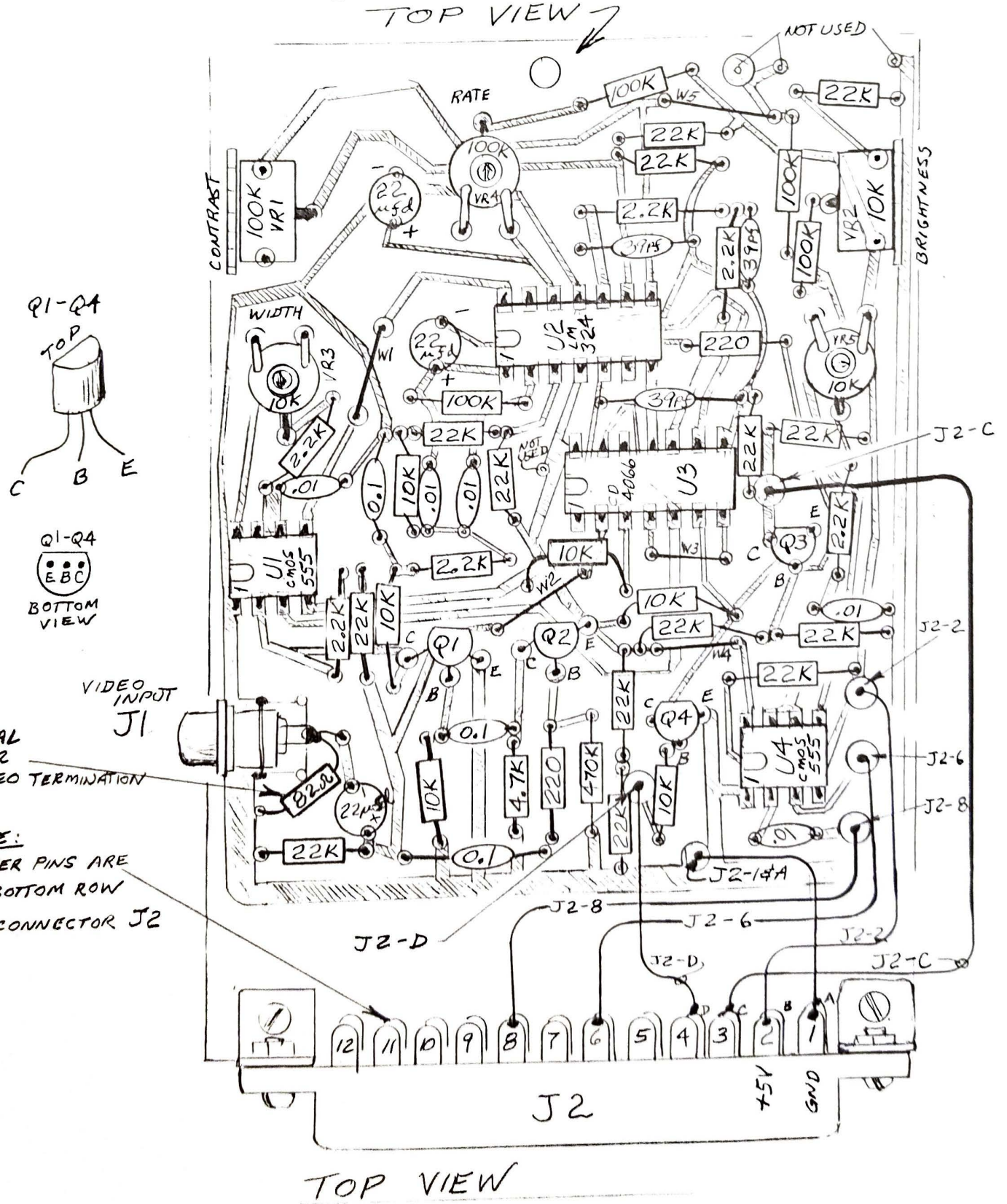


COMPONET LAYOUT
COMMODORE 64 VIDEO DIGITIZER

TOP/REAR VIEW OF J2 (SOLDER TABS TOWARD YOU)



COMPONENT LAYOUT TOP VIEW

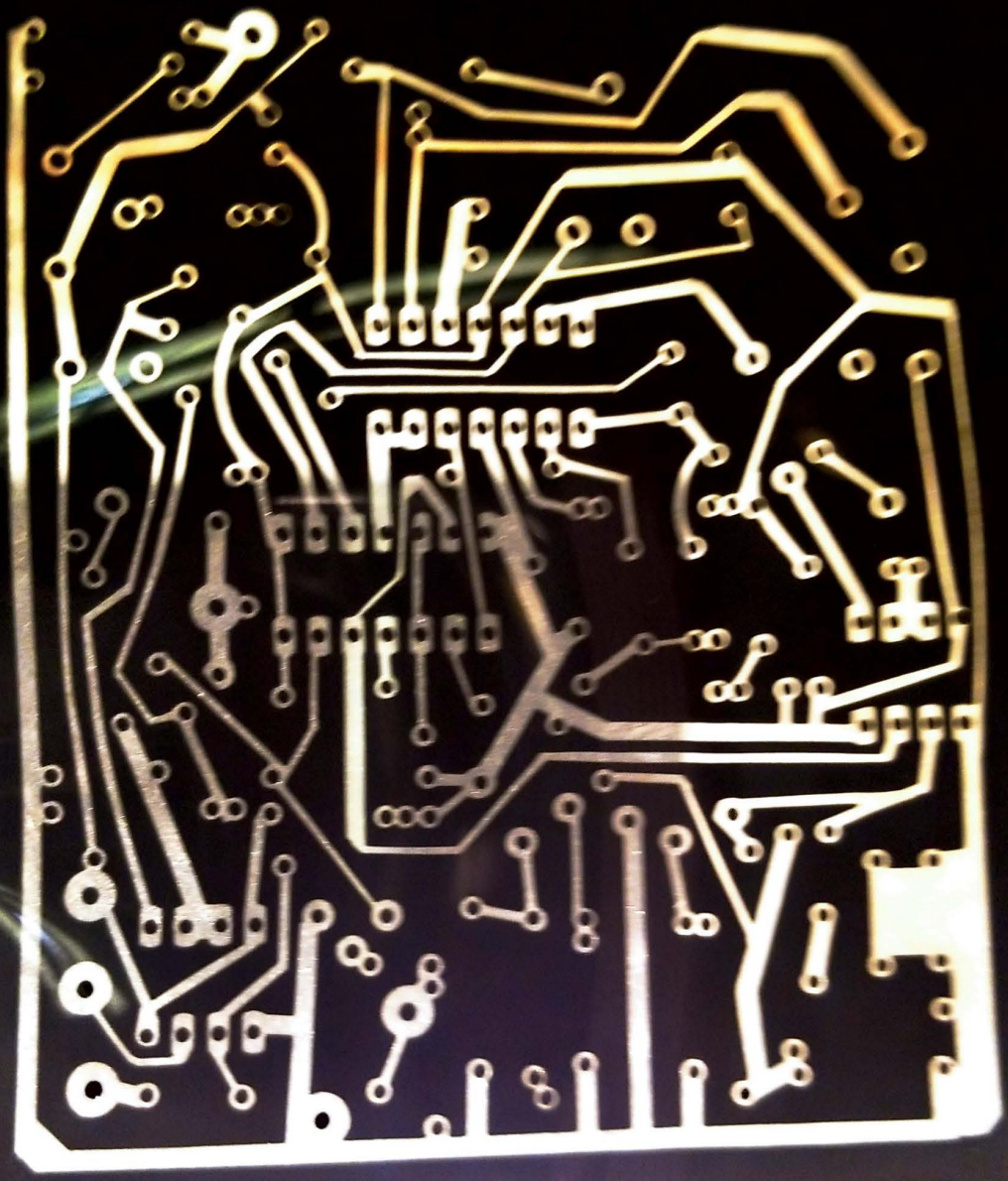


Q1-Q4
TOP
C B E

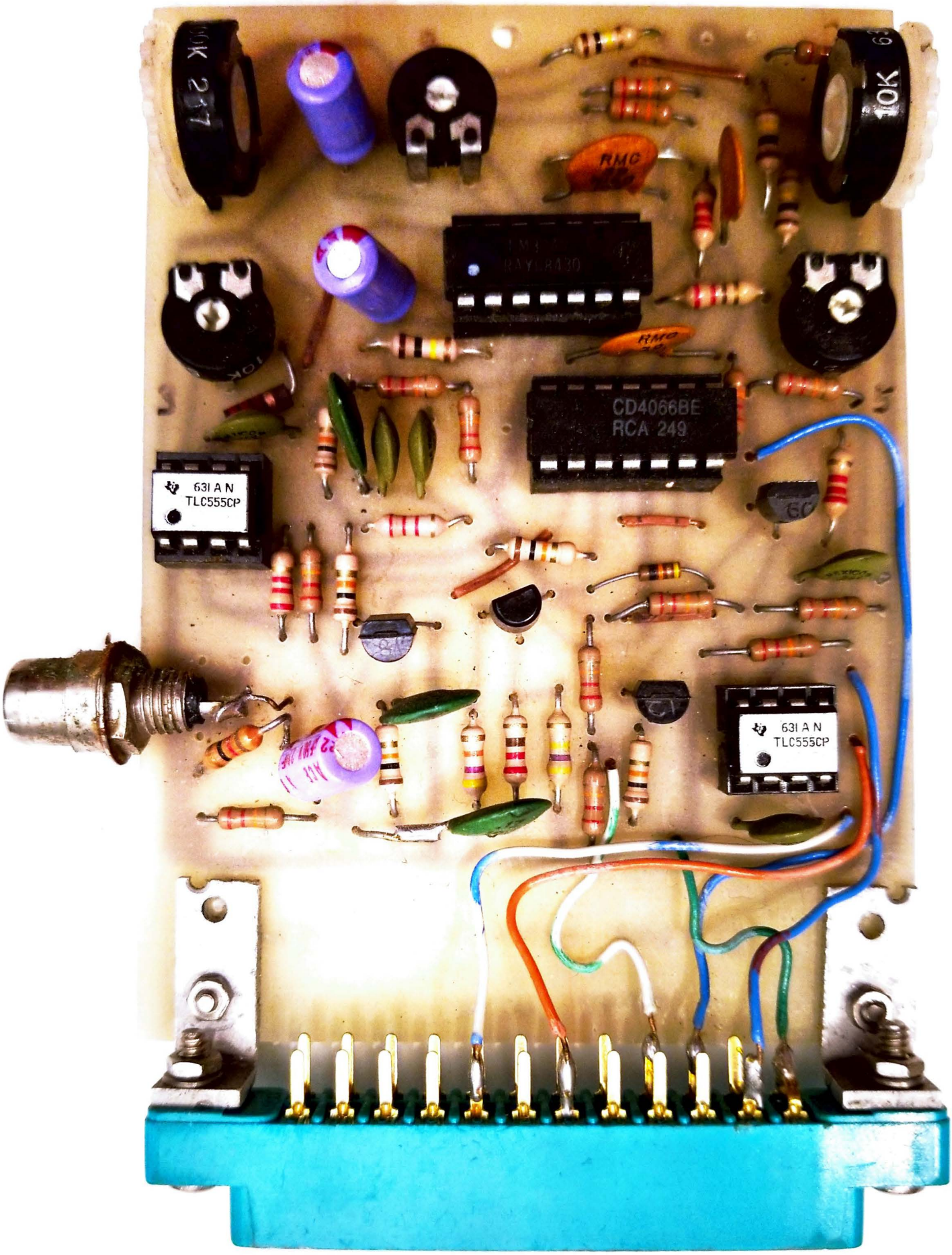
Q1-Q4
E B C
BOTTOM VIEW

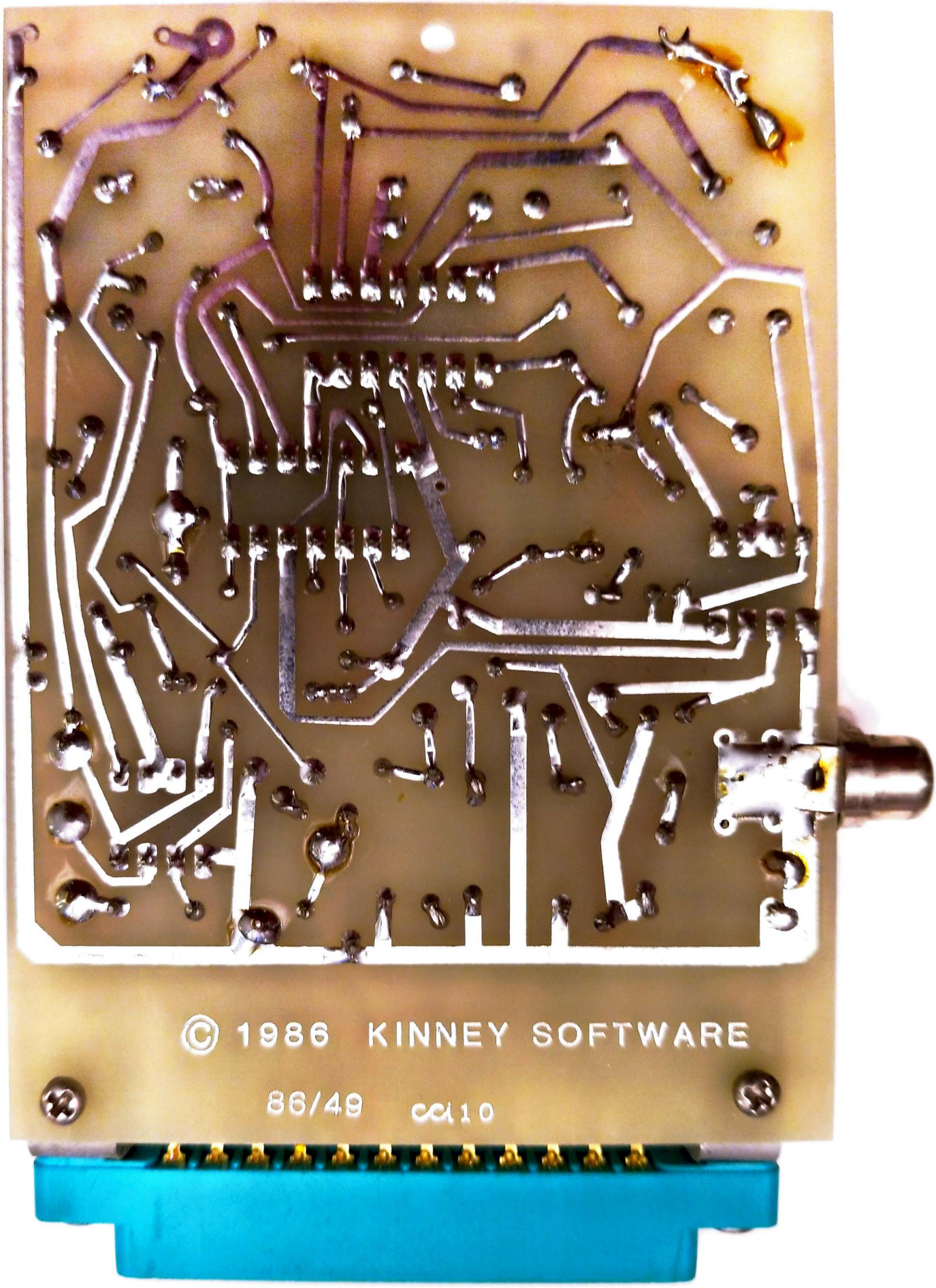
NOTE:
LETTER PINS ARE ON BOTTOM ROW OF CONNECTOR J2

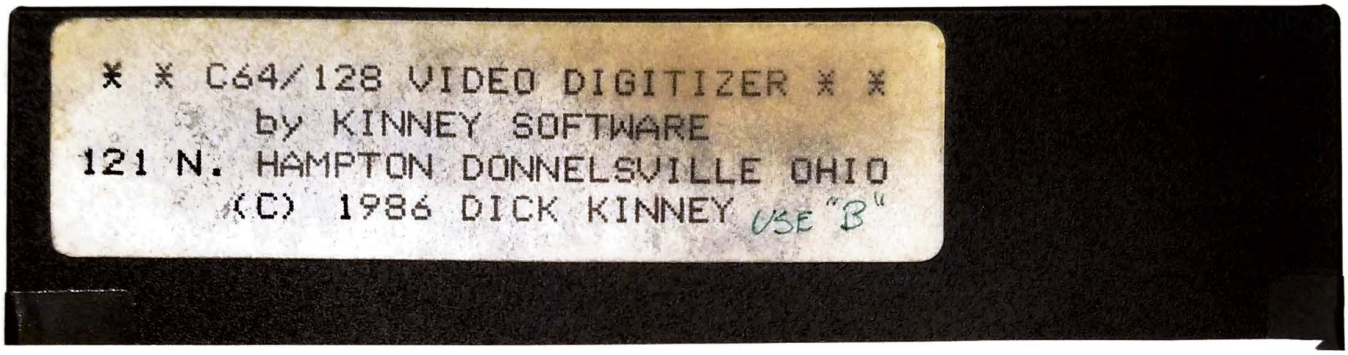
TOP VIEW



86/49 cc10


10K
RMC
CD4066BE
RCA 249
631 A N
TLC555CP
631 A N
TLC555CP


© 1986 KINNEY SOFTWARE
86/49 cc10


* * C64/128 VIDEO DIGITIZER * *
by KINNEY SOFTWARE
121 N. HAMPTON DONNELSVILLE OHIO
(C) 1986 DICK KINNEY
USE "B"

REVIEWS

VIDEO DIGITIZERS

For the C-64

Text and Photos by Morton Kevelson

It seems that everything is going digital these days. Compact discs have revolutionized home audio reproduction, digital televisions are starting to appear, and digital audio tape recording is ready and waiting in the wings. All of these processes have one thing in common. Their original data is fundamentally analog.

Precisely speaking, an analog process is one which is characterized by a continuously varying signal. The value obtained by measuring the signal is dependent on the precision and response time of the measuring instrument. It is thus possible to glean additional information from an analog signal by improving your measuring instruments.

By comparison, a digital process is characterized by the presentation of data in discrete packets at uniformly timed intervals. Once data is placed in digital form, the limits of precision are fixed. The quality of data in an eight bit format is not improved by feeding it into a sixteen bit machine.

Although analog phenomena are characterized by theoretically infinite resolution (our apologies to the quantum physicists in our audience), it is possible to digitize these processes with acceptable accuracy. In this way a finite series of samples, with a limited range of values, can be made to adequately represent the original data.

The required degree of accuracy is of course determined by the intended application. For example, audio digitization for compact discs is accomplished by sampling the sounds approximately 44,000 times per second with twelve data bits allocated to each sample. When properly decoded, the resulting sound is nearly indistinguishable from the original.

The advantages of digitizing analog data are numerous. Endless copies of digital data can be made without any loss of resolution. The data itself may be manipulated by computer processing emphasizing the desired response while eliminating noise and distortion. Anyone who has compared the best vinyl recordings to the compact disc will attest to the effectiveness of this process.

Visual images may also be captured as digital data for computerized

Top left: Computereyes high contrast capture in **Koala** *multicolor format. Top right: A 280 × 192 pixel image by Computereyes II and Spartan. Right: 8 level, 160 × 200 pixel Kinney image.*

processing. We first looked at this process on the C-64 a bit over one year ago. At that time we reported at some length on the Computereyes video digitizer for the C-64. The quality of that product, its relative simplicity in terms of both hardware and software, and its reasonable cost, combined with the growing size of the Commodore market, led us to believe that we would have been able to present several such products well before this time. Thus when we finally accumulated three digitizers from what it turned out were not independent sources, we forged ahead with this presentation.

We have previously indicated the worth of a C-64 image at up to 10,001 bytes. If we consider the byte as equivalent to a computer word, this is substantially more than the 1,000 words normally charged for a picture. As we have pointed out, a word is worth a millipicture. The price of a C-64 image has not changed a bit. However, if you peruse the review of Digiview for the Amiga elsewhere in this issue, you will find out the true cost (in terms of data and not dollars) of quality graphics. We must issue a strong word of warning before you turn to the Amiga Section. Side by side comparisons of Amiga graphics against 64 has been known to cause grown men to weep, women to sigh, and children to crow with delight. The net effect is invariably stressful on your pocketbook.

A Brief Dissertation on the C-64 Bit Map Display

An appreciation of the way the C-64 displays bit-mapped images will be useful for getting the most out of your video digitizer. The C-64 has two bit map display modes. Both modes utilize an 8,000 byte data block as the basis of the display.

The hi-res mode generates a graphic screen which is 320 pixels wide by 200 pixels high. A quick calculation reveals a one-for-one correspondence between each bit of the bit map and every pixel. Associated with the hi-res bit map is an additional 1000 bytes of color data. Inasmuch as the C-64 only displays 16 colors, it is possible to store two color values in each color byte. The value of the lower half of the color byte corresponds to pixels whose bit value is zero. The upper color nybble is linked to pixels with a bit value of one. There is a 64 to 1 correspondence between the 8000 byte bit map and the 1000 byte color map. Every 8 by 8 area of the bit map screen is assigned to a single byte of the color map.

The multicolor mode produces a graphic screen consisting of 160 pixels across by 200 pixels high. This is half the horizontal resolution of the hi-res mode. Note that the screen display is the same size, as each pixel is now twice as wide. The advantage of multicolor mode is increased color flexibility. Since two bits now correspond to a single pixel, we can generate four values and display as many as four colors within each eight byte, 64 bit, 32 pixel display cell. One of these colors is defined by the contents of a single nybble which sets the background color of the entire display screen. Two more of the colors are stored in a 1000 byte block which corresponds to the color data of the hi-res screen. The remaining color is taken from the values in an additional 1000 nybbles of color data. Thus each four by eight pixel block of the multicolor screen may display up to three independent colors and a fourth background color which is common to the entire screen.

To summarize, a hi-res image consists of 8000 bit map bytes and 1000 color bytes for a total of 9000 data bytes. Each eight byte, 64 pixel graphic block of the hi-res screen has an associated color byte which defines its two possible colors. A multicolor image contains all of the above plus an additional 1000 nybbles of color data plus a single nybble to define the screen background color. Since the color memory nybbles each occupy a unique byte address, the total multicolor picture consists of 10,001 bytes. Each eight byte, 32 pixel graphic block of the multicolor screen has associated with it 1½ bytes

READER SERVICE INDEX

Page	Company	Svc. No.
63	Abacus Software Inc.	251
65	Abacus Software Inc.	252
C-4	Access Software Inc.	245
10	Accolade	291
10	Accolade	292
85	American Int'l Computer Products	282
41	The Avalon Hill Game Company	230
20,21	Berkeley Softworks	237
29	Berkeley Softworks	238
31	Berkeley Softworks	239
23	Berkeley Softworks	242
25	Berkeley Softworks	243
27	Berkeley Softworks	244
49	Business Opportunity Publishers	257
57	Business Opportunity Publishers	258
79	Business Opportunity Publishers	259
87	Business Opportunity Publishers	260
51	Central Point Software Inc.	261
7	Cheatsheet Products, Inc.	283
11	COMAL Users Group USA	–
13	COMAL Users Group USA	–
13	Commodore International	295
34	CompuServe	270
35	Computer Mart	240
28	Computer Centers of America	250
84	Computer Swap, Inc.	278
C-2	Digital Solutions Inc.	266
C-3	Dreamrider Software Inc.	236
14	Dune Systems	287
44	Electronic Arts	231
38	Electronic One	269
61	Emerald Component Int'l	263
47	Epyx	233
47	Epyx	234
71	Free Spirit Software, Inc.	268
24	HesWare	241
12	Howard W. Sams & Co.	294
68	Inkwell Systems	254
44	Intellicreations	232
59	Jason-Ranheim	271
36	KFS Software, Inc.	276
11	Lease Program Headquarters	293
4,5	Lyco Computer	255
12	Master Software	272
60	Maxtron	275
52	McGraw Hill	–
89	Metacomco	273
39	Microcomputer Services	267
83	Micro-W. Distributing, Inc.	279
12	Midwest Software	285
53	New Tek	288
82	Ohio Computer Services, Inc.	281
15	Precision Peripherals & Software	253
42,43	Pro-Tech-Tronics	256
16-19	Protecto Enterprizes	277
40	R.J. Brachman Assoc. Inc.	262
8	Simon & Schuster Software	290
50	Skyles Electric Works	249
9	Software Discounters	247
6	S&S Wholesalers, Inc.	246
48	Strategic Simulations	235
8	Suncom	289
14	Superior Micro Systems, Inc.	286
13	Supra Corporation	296
80	T.C. Electronics	274
83	TecTrans	280
46	Unlimited Software Inc.	265
66	Value-Soft	248
61	Wedgwood Rental	264
10	Xetec, Inc.	284
30	*Ahoy!* Back Issues	–
38	*Ahoy!* Disk	–

The publisher cannot assume responsibility for errors in the above listing.

of color data which define three independent colors for each cell.

Video Sources

You can't digitize an image without an image to digitize. None of the C-64 digitizers are particularly fussy about the source of the images, as long as they are fed a standard NTSC video signal. In a pinch, the video output of a home VCR can be used if nothing else is available. A stationary video frame is essential, as the digitizers all require several seconds to capture an image. Some time will also be required to adjust the digitizer's brightness control. A video camera is the best source, as it also lets you choose the subject matter. The color camera of your home video system will do just fine.

Connection to the digitizers is via a standard RCA type phono jack. Some cameras have a special cable for their VCR. A simple solution is to patch the camera through the VCR using its built-in video output. For the bargain-conscious Commodore user, a possible low-cost alternative to a color camera or VCR is a black and white camera. These cameras can often be found selling as no-frills security devices ranging in price from $150 to $300.

COMPUTEREYES

Digital Vision Inc.
Commodore 64/128
Price: $129.95

We reported on Computereyes, in considerable detail, in the September 1985 issue of *Ahoy!* Our opinion of this product remains unchanged. Since that time, the manufacturer has added some additional support software to link Computereyes to recent C-64 graphics packages.

Computereyes consists of a hardware module and supporting software on disk. The Computereyes black box plugs right into the C-64/C-128 user port. It does not interfere with the cassette port (on the C-64) or the RGB port (on the C-128), as it is the same width as the user port connector. Two adjustments are provided. The first syncrhonizes Computereyes to your video source. This setting is easily done with the help of the supporting software.

The second adjustment compensates for the brightness of the image or the intensity of the signal. The setting of this control has a direct bearing on the appearance of the image. The adjustment is also rather sensitive, with small movements resulting in a large change in the appearance of the digitized image. The software provides for a special adjustment mode which continuously scans the image without blanking the display. This lets you make a coarse setting of the brightness control. The fine adjustment will still have to be done during the actual digitization.

System Software

All of the Computereyes operations are listed on the single menu screen. A concise manual details all of the functions. Most of the manual can be dispensed with, as all of the essential operating instructions are included in a set of disk-based help files.

The basic system software lets you capture an image in several formats. A single scan digitization creates a high contrast black and white image in about six seconds. The digitization process captures a single column of pixels on every video scan. Since the NTSC, non-interlaced frame rate is 60 times per second, it takes over five seconds to capture the 320 pixel columns of the C-64 hi-res mode.

In addition, a 4-level and 8-level capture can be performed. These require a corresponding number of additional scans. Digitization time for the 8-level capture is over 50 seconds. All of the images are pure 8000 byte

bit maps. Separate color data, which defaults to black and white, is not saved to the disk. Instead the gray levels are produced by varying the dot patterns. This type of bit map is well-suited for printing on a black ribbon dot matrix printer.

Although you can use the digitized images in your own programs, the basic Computereyes format does not correspond to any of the commercial graphics packages which are available for the C-64. For these, Digital Vision offers optional compatibility software in support of several popular formats.

DOODLE! from City Software was one of the first drawing programs available for the C-64. It utilizes the C-64's hi-res format to produce 320 by 200 pixel colored images. The Computereyes compatibility software for the *DOODLE!* package adds low-contrast and high-contrast modes to the three captures available with the basic software. These extra modes make use of all five of the C-64's gray levels (black, white, and three shades of gray). The gray scale data is saved in the hi-res color map which is part of the *DOODLE!* file format. The resulting images have more detail and finer gradation than the standard captures. The low-contrast capture uses four scans at adjacent brightness levels of the video image. The high-contrast capture is similar, except that a brightness level is skipped between each scan. This increases the contrast, or brightness range, of the captured image.

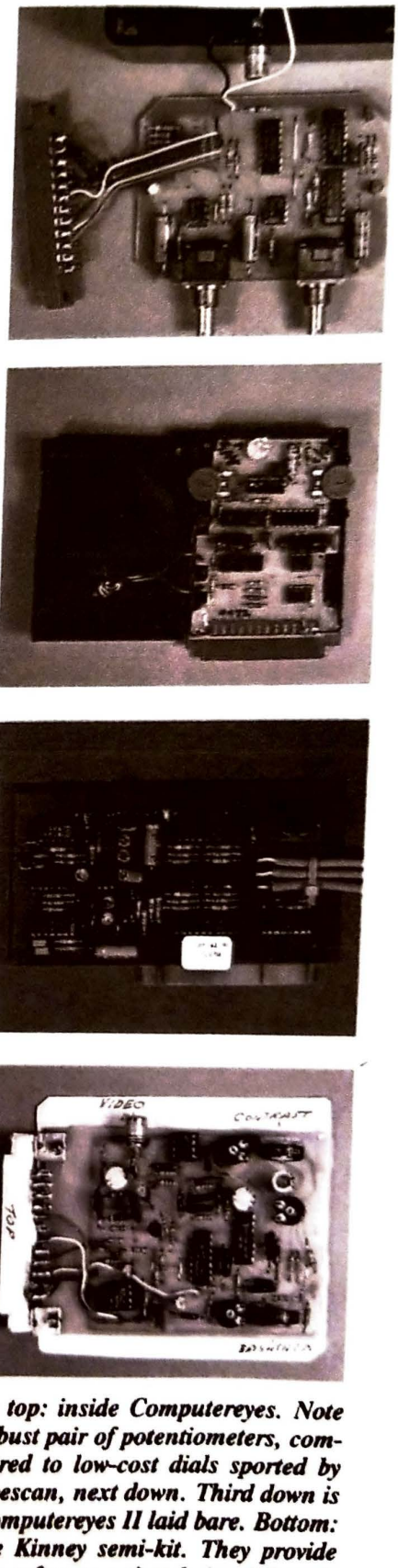
The *Flexidraw* package is a light pen driven hi-res drawing package from Inkwell Systems. The compatibility software for *Flexidraw* is very similar to the *DOODLE!* support package. The differences lie in the disk file format and the size of the bit map. The *Flexidraw* file format saves the color data in a separate 1000 byte file. Thus *Flexidraw* image files with color actually consist of two disk files. *Flexidraw* also uses the 48 rightmost pixels of the bit map screen as a menu area. Thus *Flexidraw* images are only 272 pixels wide. Computereyes still digitizes the entire bit map while marking the menu area with a purple stripe.

The *Koala* package uses the C-64 multicolor format to generate 160 by 200 pixel color graphics. In this format the Computereyes basic gray scale scans will give peculiar results. Instead, the *Koala* compatibility software provides two gray scale captures in multicolor format. These are similar to the low-contrast and high-contrast captures mentioned above. The image files are saved in the *Koala* format for use with that package. Interestingly enough, the *Koala* format graphics provided the most natural looking digitized images. This was a result of the additional color detail available with the multicolor format. For this application, the additional color outweighed the higher resolution of the hi-res format.

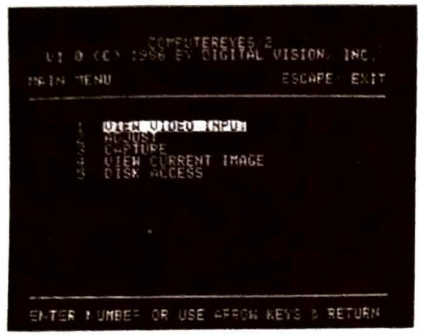
There are two image formats used by *Print Shop*. The most popular is a clip art format which uses a fraction of the entire C-64 bit-map. The second *Print Shop* image format is simply the entire 8000 byte hi-res bit map which is used by the Screen Magic section. The Screen Magic bit maps are identical to the Computereyes images as created by the basic System Software.

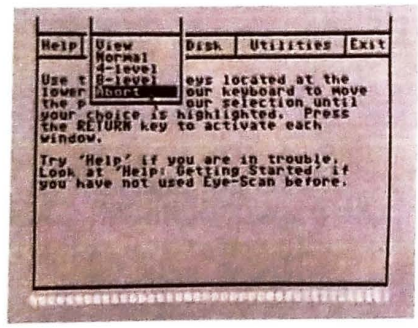
The clip art images exist in two sizes, one for use with non-Commodore printers and the other for use with the 1525/MPS-801/MPS-803 line of Commodore printers. *Print Shop* users may be familiar with the terms "Side A" or "Side B" of the *Print Shop* disk. The first class of clip art are 88 by 52 pixel images. The second class are only 44 by 45 pixel images. The *Print Shop* compatibility software lets you save a portion of the digitized bit map in either clip art format. Since the clip arts are a small portion of the entire bit map (only 7.15% and 3.1% respectively), Computereyes blocks out a larger section of the screen. A 2 by 3 pixel block of the hi-res bit map is translated into a single pixel of the larger size clip art. A 4 by 3 pixel block translates into a single pixel of the smaller clip art.

In other words approximately 43% (for the larger art) and 37% (for the



At top: inside Computereyes. Note robust pair of potentiometers, compared to low-cost dials sported by Eyescan, next down. Third down is Computereyes II laid bare. Bottom: the Kinney semi-kit. They provide the software, printed circuit board, and assembly instructions; you provide the parts, time, and labor.





Top: Kinney Software main control menu. Second down: Computereyes II main control screen. Items 2, 3, and 5 bring up additional screens. Third down: Eyescan control screen. All commands are accessed via pull-down menus. Bottom: Computereyes menu for DOODLE! *All commands are displayed, and accessible by one keystroke.*

smaller art) of the 8000 byte bit map are used to generate the clip art images. Within these constraints, the Computereyes *Print Shop* compatibility software lets you pick any part of screen as the clip art. A three level capture is also provided for use with the Screen Magic portion of *Print Shop*. This is in addition to the basic captures mentioned above. Since the Computereyes software can load as well as save files, it may be used to convert any C-64 8000 byte bit map to *Print Shop* format. For example, *Flexidraw* files are already in the proper format. *DOODLE!* files may be easily converted by stripping off the one kilobyte of color data at the start of the file.

The *Newsroom* compatibility software lets you save any 231 by 168 pixel block of the 8000 byte bit map as a *Newsroom* photo. These photos may then be manipulated with the *Newsroom's* photo lab. As with the *Print Shop*, Computereyes will let you manipulate any 8000 byte C-64 bit map.

Digital Vision Inc., 14 Oak Street—Suite 2, Needham, MA 02192 (phone: 617-444-9040).

EYE-SCAN

Digital Engineering and Design
$89.95

We received our sample of the Eye-Scan video digitizer at the West Coast Commodore Association's extravaganza last fall. Initially it appeared to be a worthwhile addition to the growing list of C-64 third party peripherals. As we began using this package we encountered a strong feeling of déjà vu. This was cleared up when we looked at what was beneath the surface. It turned out that Eye-Scan was a superficially disguised clone of Digital Vision's Computereyes.

Well, we hated being cast in the role of whistle blower, but blow the whistle we did. After a quick confirmation, the folks at Digital Vision took the expected action, and, to our knowledge, Eye-Scan is no longer available. Frankly, we are sorely disappointed by this entire incident, although it was not unexpected. The Commodore market is large enough to attract all sorts of promoters.

Nevertheless, we expect that a fair number of our readers have bought the Eye-Scan package. In addition, an undetermined number of these units may still be sitting on dealers' shelves. We feel that a brief overview of the Eye-Scan package would be useful.

The overall package is about one fourth the volume of the Computereyes. This size reduction was achieved by simply replacing the full sized brightness and sync potentiometers with smaller sized, less costly trimmer resistors. As a result the critical brightness adjustment is even more difficult to make. Long term durability of the potentiometers has also been compromised.

We had considerable difficulty disassembling the Eye-Scan package. The cartridge case had been thoughtfully sealed with copious quantities of silicone adhesive. However, we persisted and our efforts were rewarded. At this point we discovered that all the chip identification marks had been scrupulously scraped off, making identification impossible. Not quite! A comparison with the Computereyes circuit board revealed that all of the remaining components had identical values. At this point we tried the acid test. We ran up the Eye-Scan module with the Computereyes software and vice versa. The result was perfect performance in both cases.

In terms of software the folks at Digital Engineering and Design did take the trouble to completely rewrite the user interface. In the process they created a flashy series of pull-down menus for operating the system. Although these menus are very pretty, they do not facilitate the system's operation. The straightforward single keystroke menu of the original Computereyes software was faster and easier to use.

At first glance the Eye-Scan package did seem to offer more than the basic Computereyes software. Images could be saved in *DOODLE!*, *Koala*, or *Blazing Paddles* format. The first utilizes the C-64's 320 by 200 pixel hi-res format. The other two use the 160 by 200 pixel multicolor format. However, images were limited to the basic bit pattern gray scaling

without use of the C-64's own colors to generate a five level gray scale. The extra color data saved with the files contained default values which did not enhance the images.

If you did happen to buy the Eye-Scan package, you may have saved some money off the price of the Computereyes package. You may consider sending all or part of this difference to Digital Vision. This would not be a contribution by any means. In exchange you would be buying the Computereyes compatibility software for the package of your choice at their usual price. These programs do a good job of adapting the Eye-Scan/Computereyes hardware to the graphics program for which they were designed.

VIDEO DIGITIZER (V. 1.2)

Kinney Software
Commodore 64/128
Price: $39.95

Dick Kinney has a rather unusual offering for the Commodore 64 user. This is a first, if not the only, semi-kit we have come across. When you buy this package you will get a system disk, a bare printed circuit board, an instruction manual with parts list, and nothing else. You will then have to go out and purchase all the parts with which to complete the package (about $20-$30 more). You will also have to supply your own tools, time, labor, and expertise with a soldering iron and electronic assembly. When you are done, you should have a working video digitizer at about half the price of its only known competitor.

We found the entire concept to be intriguing. In fact it evoked fond memories of our younger days when we constructed all our short wave radios and hi-fi equipment from kits. However, the Kinney kit is a long way from the polished Heathkits we had grown accustomed to. Although it is not a complex project and its construction is straightforward, we can recommend it only to those with some prior experience with electronic construction techniques. We also suggest that you have access to a voltohmeter to complete the checkout of the finished project.

The circuit board is slightly larger than a standard C-64 cartridge. Its final appearance is dependent on the case you select to put it in. We were running ours fully exposed with just a paper backing on the circuit side of the board. As with the other digitizers, connection is to the C-64's user port. As the board is the same width as the user port connector, there is no interference with the cassette port or the RGB port on the C-128. A standard NTSC video signal is fed into an RCA jack mounted on the board. The RCA jack was not on the parts list, so be forewarned.

As with the other packages, the operating system consisted of the digitizing routines written in machine language with the user interface and menu display written in BASIC. The digitizing routines were surprisingly fast, requiring less than four seconds to create an image. This time was independent of the number of gray levels chosen for the final image. The short digitizing times are achieved by grabbing a vertical column of pixels every sixtieth of a second. The gray level of the image is determined at the same time, so only a single scan of all 160 columns is required. The use of a 160 column digitization marks the Kinney digitizer as primarily intended for use with the C-64's multicolor display format.

Any number of gray levels, from two to eight, may be chosen for the digitized images. However, the display format utilizes only four of the 16 available colors. Uniform values are placed in the background nybble, the low and high nybbles of the screen color matrix, and the color map. You do have the option of changing these default values for any of the available colors. The additional gray levels of the captures which use more than four are achieved by varying the dot pattern.

The digitized images may be saved to disk in several formats. These include a pure 8000 byte bit map, *Koala, DOODLE!, Print Shop* Screen Magic, and *Newsroom* Photo file.

The last option defaults to a central area of the screen and takes about two minutes to set up. Due to the 160 column digitizing scan used by this product, the best looking images are in the *Koala* format. Acceptable results can be obtained in the *DOODLE!* format by carefully choosing the number of gray levels.

Kinney Software, 121 N. Hampton Road – Dept. A, Donnelsville, OH 45319 (phone: 513-882-6527).

COMPUTEREYES II

Digital Vision Inc.
Commodore 64 with Spartan
Price: $129.95

Strictly speaking, Computereyes II is not a 64-related product. It is intended for the Apple II series of computers. However, due to the limited selection of C-64 video digitizers, we chose to bend a few rules, twist some arms, and threaten some kneecaps so we could present this as a Spartan peripheral. As we pointed out in the September 1985 issue, the Spartan is a bona fide C-64 add-on. In fact, this opens the door for a whole new world of C-64 (via Spartan) peripherals.

Speaking of the Spartan, those of you who attended the last World of Commodore in Toronto had the opportunity to pick one up for a mere $129 Canadian! Mimic Systems is apparently clearing out their remaining stock. They did mention something about further size reductions of the Spartan through the use of further circuit integration, and the development of a universal model which may be adapted to several computers.

Additionally, the review of the Computereyes II gave us the chance to see how one manufacturer implements the same product on two different machines. We would expect to see some similarities, as both the C-64 and the Spartan are eight-bit, 64K computers running on a 6502 microprocessor. We were not prepared for the major difference in operating convenience that we found.

In terms of ease of use, the Spartan version wins hands down against the C-64. We expect that a large part of the additional convenience is due to the internal construction of the Spartan's slots. Once installed, the circuit board is not readily accessible to the user. As a result all adjustments have to be done via the computer's keyboard. The initial calibration of Computereyes II is performed automatically with the setup parameters saved to the system disk. These are automatically loaded with each subsequent use. Even the brightness and contrast adjustments are performed via the keyboard with a graphical display. This makes for repeatable adjustments which are not available with the manual controls on the C-64 version.

Computereyes II is also equipped with three video cables. One of these intercepts the video connection to the computer's monitor. A second hooks up to the monitor and the third picks up the video signal. The result lets the user easily switch between the display of the computer's output or the video source directly from the keyboard. This arrangement is very convenient when setting up an object for digitization.

In terms of image quality, the C-64's superior graphics win handily. The Spartan's hi-res graphic display consists of 280 by 192 pixels. This is somewhere between the resolution of the C-64's multicolor and hi-res displays. In addition, the restrictions in the way the Spartan handles color limits its use with digitized images. As a result, Computereyes II must rely entirely on dot patterns to establish the gray levels.

With the Spartan you have a choice of two image captures. The first is a single level scan which generates a pure black and white image. The second is a multilevel scan which simulates a gray scale by the use of dot patterns. Either scan is accomplished in a bit over six seconds. Images may be saved to disk in either packed or unpacked format. The former saves disk space; the latter is the standard Spartan bit map for use with other Spartan graphics packages.

If you do decide to order Computereyes II for the Spartan, indicate your need for the DOS 3.3 version. The disk is normally supplied for use with ProDOS which we were unable to use on the Spartan. Digital Vision has agreed to supply *Ahoy!* readers and Spartan users with the DOS 3.3 version.

Digital Vision Inc., 14 Oak Street – Suite 2, Needham, MA 02192 (phone: 617-444-9040).

Conclusions

Unfortunately, C-64 users do not have a wide range of options when it comes to video digitizers. Unless you are prepared to assemble your own hardware there is only a single choice: Computereyes from Digital Vision.

If we disregard the problem of hardware assembly, direct comparisons are possible. Computereyes does provide a better digitized image, in particular with the optional *DOODLE!* or *Koala* Compatibility Software. These supplementary programs fully utilize the Commodore 64's color capabilities for better looking gray scale images.

When it comes to speed, Kinney Software is the clear winner. A complete image may be digitized in less than four seconds, with up to eight gray levels. However, the digitized image is limited to only 160 pixels horizontal resolution. Kinney also does a less than optimum job of utilizing the C-64's color capabilities by limiting color choices to four out of five possible levels.

Overall, we find some room for improvement with both products. Computereyes would greatly benefit from faster digitization routines. We would also like the convenience of automatic calibration and switching between the video source signals. Digital Vision has already demonstrated this capability with Computereyes II and the Spartan. Kinney Software could also add true 320 pixel hi-res capability and better C-64 color routines to their product.

All programs in this issue are available on disk. See page 37.